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THE MEDICAL USE OF LEECHES IN CONTEMPORARY SPAIN: BETWEEN SCIENCE AND TRADITION

KORIŠTENJE PIJAVICA U MEDICINSKE SVRHE U SUVREMENOJ ŠPANJOLSKOJ: NA RAZMEĐU ZNANOSTI I TRADICIJE

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Summary

In Spain leeches have been used both in popular and scientific medicine throughout its history. In this study we analyze the historical fluctuations of leech therapy. At the start of the 20th century it was still being used in in scientific medicine, as can be seen in the treatment administered to Germán Gamazo, a minister during the reign of Alfonso XII and the regency of Archduchess Maria Christina of Austria, during a serious illness in 1901. Leech therapy was to fall dramatically into disuse and was to survive only in folk medicine, with leeches losing their reputation as a therapeutic agent. The data obtained is the result of a systematic review of the literature and of the major databases in the fields of folklore, ethnography, social anthropology and medical anthropology. Leeches have been used in Spanish folk medicine to treat ailments and disorders in up to 11 categories of the International Statistical Classification of Diseases and Related Health Problems (ICD-10), particularly in the treatment of diseases of the circulatory, respiratory and musculoskeletal systems. According to the available literature, they were part of the folk therapeutic arsenal, at least until the seventies

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of the last century. Our study also provides information about the medicinal use, commerce and consumption of these animals in recent years.

Key words: *Medicinal leeches; folk medicine; historical review; consumption; Spain.*

Introduction

Ever since ancient times, many illnesses have been associated with an excess of blood and blood-letting was applied to treat them[1]. Throughout history, this therapy has been used as part of both Spanish folk medicine[2] and scientific treatment. For example, Gil-Sotres highlights the role of methods such as phlebotomy, cupping and leeches as methods for drainage in the medical tradition of the Middle Ages (see Gil-Sotres, 1986a, 1986b, 1990, 1994), and Erkoreka cites the first medical text printed in Vasconia, in the Basque Country, in 1495[3], which contains a comprehensive chapter dedicated to blood-letting. Meanwhile, Amezcua (1997, p.32), compiling a study on barber surgeons and phlebotomist blood-letters in the city of Granada in the 17th and 18th centuries, suggests that perhaps they were "the most characteristic professionals in the empirical practice of medicine in Modern Spain". Similarly, the use of these therapeutic practices was to be justified in the 19th century with the work of the University of Paris professor François Joseph Victor Broussais (1772-1838). This eminent scientist was the architect of a trend in medicine known as "physiological medicine", which was the subject of great scientific controversy in the first half of the 19th century. "Broussaisism", as it was termed, was notable by virtue of the fact that it was the last of the heterodoxical medical systems to stand out against anatomical and clinical medicine, as well as by its contribution to the emergence of what came to be known as the "German pathophysiological movement" (Miqueo, 2011, p.3). In Spain, Broussais's work was disseminated by Manuel Hurtado de Mendoza in the journal *Décadas Médico Quirúrgicas* (1821-1828) (Miqueo, 1986, p.419-450). Miqueo wrote a summary on "the essence of Broussaisism", illustrated by the following four statements:

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1 See, for example, the Works of Mory *et al.* [2000]; Whitaker *et al.* [2004]; Elliott y Kutschera [2011] and Johnson [2011].

2 The concept of Spanish folk medicine and its evolution have been widely discussed by Vallejo and González [in press]. Its use on many occasions has ideological connotations and to understand it one must consider the context, the particularities of the scientific field in which it is applied and its evolution in disciplines such as the History of Medicine, Ethnobiology, Ethnomedicine or Medical Anthroplogy.

3 The work cited in Erkoreka [2002, p.129-130] presents a treatise entirely on phlebotomy or blood-letting.

1. Illnesses are an irritation, i.e. there is increased sensitivity and contractility of the gastrointestinal mucosa caused and sustained by the various vital stimulants;
2. these irritations, depending on their intensity, cause change or modification in the functions of the part of the body where they occur, but also in the parts affected as a sympathetic effect (histological similarity);
3. this dysfunction is the cause of the morphological disorganisation (lesions) observable in autopsies and of the symptoms observable in the clinic;
4. therapeutic action must be immediate and must be directed towards the early dysfunction and based on antiphlogistic remedies" (Miqueo, 2011, p.4).

One of the anti-inflammatory treatments used would have been blood-letting, since many pathologies manifested by way of inflammation and congestion of the blood, according to this medical system (Schott, 2004, p.255; Miqueo, 2011, p.5). Interestingly, Brousssais's work is marked by the inclusion of works by John Brown (1735-1778) and Xavier Bichat (1771-1802). Using mathematical scales, Brown postulated that the maintenance of health is due to a balance between discrete stimulus and natural excitement. For these authors, the aetiology of most of the illnesses was due to the absence of moderate stimuli that led to physical weakness. Moreover, the vitalist theories of Xavier Bichat, set out in his works *Estudios fisiológicos sobre la vida y la muerte* and *Anatomía general* (1801), propose, on the one hand, that the processes and properties of living beings are based on morphology and on the other, that tissues would form the basis of anatomy. Following this, Broussais stated that intense stimuli cause the disease that manifests in certain tissues. The idea is that when the nervous system receives a stimulus from an excited organ, it sends it to other parts of the body, causing other symptoms. So, blood-letting with leeches would be effective since it reduces the inflammation and blood congestion caused by the over-stimulation causing the disease (Chisholm, 1911, p.656; Baudet, 1968, p.919; Albury, 1998, p.228-232; Schott, 2004, p.254-255).

Following these principles, blood-letting practices were used for acute illnesses in almost all cases of local inflammation, to calm severe pain, gastroenteritis, high fever, smallpox, measles, gout, dropsy, cancer, and as a prophylactic. It was used on thighs, vulva, behind the ears for ophthalmia

and cerebral congestion, and exclusively for adults, while contraindicated in children under fourteen years old and the elderly (Amo y Mora, 1869, p.329; Schott, 2004, p.255; Miqueo, 2011, p.20).

In choosing leeches as a particular blood-letting method, it was important to consider that the viscosity of the blood collected by these annelids and the extent of their action were within the observable values for cupping and phlebotomy. Their amount of fluid and heat given off were also considered (Gil-Sotres, 1990, p.21). According to Barandiarán and Manterola (2004), the use of leeches was a practice rooted in folk medicine, used by ordinary people, while doctors preferred to perform blood-letting by cutting (Barandiarán, Manterola, 2004, p.327).

In the 19th century it was clear that the most useful leech for blood-letting was the one described by Linnaeus (*Hirudo medicinalis* Linnaeus, 1758), although it was thought that different species existed according to their colouring. In Spain the *grisea* and *viridis* varieties were used, and the variety *troctina* (*Hirudo troctina* Johnson, 1816), bred in North Africa, was also of commercial interest (Amo y Mora, 1869, p.325-326); the existence was also known of another leech of the variety *sanguisuga* (meaning "bloodsucker"). This leech, known as the "black" leech, was erroneously considered to be poisonous and was not used for medical purposes (Amo y Mora, 1869, p.326). It corresponds to the species *Haemopis sanguisuga* (Linnaeus, 1758), known as the "horse-leech".

Three "valid" species from the genus *Hirudo* are included in the Fauna Europaea project[4]: those already mentioned *H. medicinalis* –occurring across most of Europe, including mainland Spain–, *H. troctina* –endemic to the Iberian Peninsula and North Africa–, and *H. verbana* Carena, 1820, native to central Europe, but not found in Spain[4]. Recently, Hildebrandt and Lemke (2011, p.1000) have argued that the taxonomic status of these European medicinal leeches is "questionable" since they are species that are crossed in the laboratory. Meanwhile Kutschera (2012, *passim*) shows that these taxa should be understood as a complex of closely related species, and that *H. verbana*, economically the most important taxon, is polymorphic. Genetic analysis using mitochondrial sequences and nuclear microsatellites have shown that

[4] The project "Fauna Europaea" is an online service funded by the European Commission where experts in taxonomy provide data on all the species known to be present in Europe. We consulted Minelli, A. [2004], Fauna Europaea: Annelida: Hirudinea, Fauna Europaea version 2.5, [on line], available at: http://www.faunaeur.org [last visited 31 July 2012].

those leeches marketed as being of the species *H. medicinalis* are in fact leeches of the species *H. verbana* (Siddall et al., 2007, pp.1483-1484).

Leaving aside the taxonomic disputes, the natural history of medicinal leeches –hermaphrodite annelids living in freshwater habitats (ponds, swamps, etc)– presents a number of important characteristics from the point of view of medicine. They are true bloodsuckers, and when they find their prey (especially mammals), they quickly attach themselves by their anterior sucker. They are very sensitive to stimuli associated with the presence of prey; for example, they are attracted by the heat given off by mammals. Their mouth has serrated chitinous jaws, with which they can cut skin. With their anaesthetic and anticoagulant saliva, they can suck from 10 minutes to one hour without causing any pain. Once a leech detaches itself the cut continues to bleed for several hours. The blood is stored in the crop with hirudin, which is an anticoagulant peptide that prepares it for decomposition (Sawyer, 1986; Singh, 2010; Elliott, Kutschera, 2011; Johnson, 2011). The blood is digested very slowly, avoiding fermentation by pathogens. It is known that *H. medicinalis* maintains this symbiotic relationship in the digestion with bacteria from the genus *Aeromonas*, which, moreover, maintains itself in culture by secretion of the natural antibiotic penicillin, protecting both the relationship and the leech itself (Graf, 2000, *passim*).

Thus, the aims of the present work were as follows: (i) to determine the fluctuations in the use of leech therapy in Spain during part of the Contemporary Era, (ii) to gather together the conditions and disorders for which leeches have been used in popular Spanish medicine, and (iii) to describe the history of their use in Spain.

Material And method of study

To analyse the use of leeches in Spanish folk medicine, studies in folklore, ethnography, social and medical anthropology research were used, from 1881, the year in which Machado y Alvarez announced the foundation of the national organisation *El Folclore Español* – "*sociedad para la recopilación y estudio del saber y las tradiciones populares*" (Spanish Folklore –"*a society for the collection and study of knowledge and traditional lore*") (Ortíz García, Sánchez Gómez, 1994, p.311), up until 2013. We found that, currently, the international databases do not contain studies on folk treatments using leeches in Spain. We then proceeded to search the databases of the Spanish National Research Council (CSIC - *Consejo Superior de Investigaciones Científicas*),

the bibliographical portal Dialnet, Google Scholar and the catalogue of the Public State Libraries (BPE - *Bibliotecas Públicas del Estado*). Searches were also made in the digital archive of the National Library of Spain (*Biblioteca Nacional de España*), as well as the newspapers *ABC* and *La Vanguardia*, to assess the thinking of Spanish society in relation to leech therapy. The search terms used were: anthropology, history of medicine, ethnomedicine, folk medicine, folklore, zoology, ethnozoology, leeches, *Hirudo* and *H. medicinalis*, in Spanish or English, as appropriate.

Once the data on the therapeutic use of leeches had been obtained, the complaints treated were classified according to the chapters of the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10 Version: 2010)[5].

Results and discussion

Leeches have been used in Spanish folk medicine to treat ailments and disorders included in the 11 chapters of ICD-10. In the attached table, these health problems have been listed under the following chapters: I - Certain infectious and parasitic diseases, VI - Diseases of the nervous system, IX - Diseases of the circulatory system, X - Diseases of the respiratory system, XII - Diseases of the skin and subcutaneous tissue, XIII - Diseases of the musculoskeletal system and connective tissue, XIV - Diseases of the genitourinary system, XV - Pregnancy, childbirth and the puerperium, XIX - Injury, poisoning and certain other consequences of external causes. Some illnesses have been included in the chapter relating to external causes of morbidity and mortality (Chapter XX), or in the chapter concerning symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (Chapter XVIII).

[5] Electronic edition of the ICD-10, available at: http://apps.who.int/classifications/icd10/browse/2010/en [last visited: 7 Apr 2013].

List of diseases and conditions treated using leeches in Spanish folk medicine

ICD-10	Disease or condition treated	Locality or region	Province or Autonomous Community	Reference
I	Infectious inflammation	Alburquerque	Badajoz	López Cano, 1984
I	Infections	Pallaruelo de Monegros	Huesca	Ullod, 1994
I	Tuberculosis	——	Asturias	Fernández García, 1995
I	Typhus	El Bierzo	León	Fernández Álvarez, Breux, 1998
I	Parotitis (mumps)	Roldán	Murcia	Rabal Saura, 2006
VI	Stroke	Trévago	Soria	Carrascosa, 1991
VI	Local blood-letting in cases of cerebral congestion	Santa Cruz de la Sierra	Cáceres	Guío Cerezo, 1992
VI	Headaches	Campo de Cartagena	Murcia	Rabal Saura, 2006
VI	Headaches	——	Cáceres	Tejerina Gallardo, 2010
IX	Blood-letting for pain in the side	——	Extremadura	González Pozuelo, 1985
IX	Circulation problems	——	Galicia	Vázquez Gallego, 1989
IX	Congestion of the legs	——	Galicia	Vázquez Gallego, 1989
IX	Varicose veins	Soria	Soria	García Arambilet, 1990
IX	Purifying the blood	Santervás del Burgo	Soria	García Arambilet, 1990
IX	Blood rising to the head	——	Soria (widespread use in the province)	García Arambilet, 1990
IX	Cerebral congestion, stroke or "brain attack", uterine haemorrhage, congestion of the blood and fainting fit	——	Soria (widespread use in the province)	García Arambilet, 1990
IX	Hypotension	——	Soria (widespread use in the province)	García Arambilet, 1990
IX	To lower high blood pressure	Torremenga	Cáceres	Mateos Romero, 1990

ICD-10	Disease or condition treated	Locality or region	Province or Autonomous Community	Reference
IX	Poisoning and vascular diseases	Valdevimbre	León	Rúa Aller, Rubio Gago, 1990
IX	Haemorrhoids	——	Castile and León	Carril, 1991
IX	Bleeding	——	Salamanca	Carril, 1991
IX	Vascular disorders	La Vellés, Brincones	Salamanca	Carril, 1991
IX	Local blood-letting in cases of ... pneumonias, etc.	Santa Cruz de la Sierra	Cáceres	Guío Cerezo, 1992
IX	To "lower the blood"	Comarca de Monzón	Huesca	Ferrández, Sanz, 1993
IX	To combat so-called "thickened blood"	Coca	Segovia	Fragua Gil, 1994
IX	High tension	——	Valencia	Gil Barberá, Martí Mora, 1997
IX	Removing bad blood	Fuenteheridos	Huelva	Garrido Palacios, 1999
IX	Thickened blood	Merindad de Campoo	Santander	Moreno Landeras, Gutiérrez Delgado, 2001
IX	Cerebral thrombosis	Sayago	Zamora	Panero, 2005
IX	Apoplexy	Serradilla	Cáceres	Domínguez Moreno, 2006
IX	Cerebral congestion	Serradilla	Cáceres	Domínguez Moreno, 2006
IX	Hypertension	Serradilla	Cáceres	Domínguez Moreno, 2006
IX	To relieve congestion	Valencia del Mombuey	Badajoz	Gregori, 2006
IX	Blood-letting	Campo de Cartagena	Murcia	Rabal Saura, 2006
IX	Raised blood pressure	Campo de Cartagena	Murcia	Rabal Saura, 2006
IX	Varicose veins	Roldán	Murcia	Rabal Saura, 2006
IX	Arterial hypertension	——	Palencia (widespread use in the province)	Muriel Martín, 2008
IX	Purifying the blood, high blood pressure	Malpartida de Plasencia, Serrejón, Torrejón el Rubio	Cáceres	Tejerina Gallardo, 2010
IX	Purifying and thinning the blood	Goizueta	Navarra	Barandiarán, Manterola, 2004

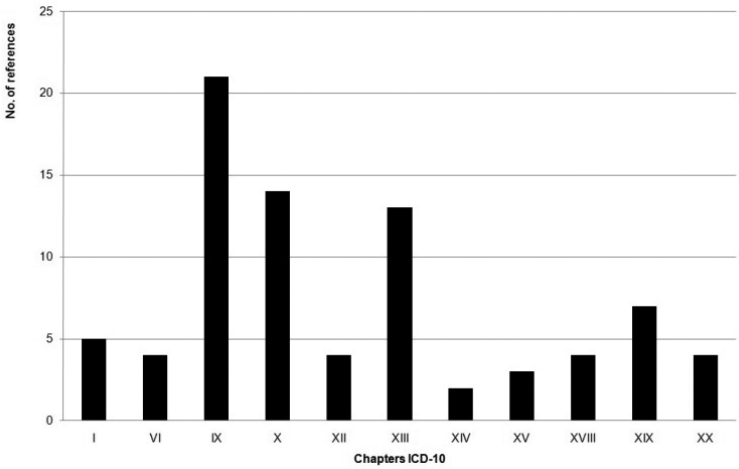
ICD-10	Disease or condition treated	Locality or region	Province or Autonomous Community	Reference
IX	Strong blood	Busturia	Vizcaya	Barandiarán, Manterola, 2004
IX	Thick blood	Goizueta	Navarra	Barandiarán, Manterola, 2004
IX	To remove bad blood	Apellaniz	Álava	Barandiarán, Manterola, 2004
IX	Blood pressure too high	Beasain	Guipúzcoa	Barandiarán, Manterola, 2004
IX	Embolism	Les Valls d'Aguilar (comarca del Alto Urgel)	Lérida	Altimiras, Casassas, Montañà, 2011
IX	Very high blood pressure	Les Valls d'Aguilar (comarca del Alto Urgel)	Lérida	Altimiras, Casassas, Montañà, 2011
IX	Blood-letting	Doñana	Huelva-Sevilla (Andalusia)	Cobo López , Tijera Jiménez, 2013
X	Pneumonia	Estribela (Lourizán)	Pontevedra	Becoña, 1981
X	Pneumonia (pain in the side)	Martín de Yeltes, Gajates, Robleda, Salamanca	Salamanca	Blanco, 1985
X	Pneumonia	Robleda, Tardáguila, Tarazona de Guareña	Salamanca	Blanco, 1985
X	Angina	La Alberca	Salamanca	Blanco, 1985
X	Pneumonia	Torre los Negros	Teruel	Sebastián Domingo, 1988
X	Pneumonia	——	Soria (widespread use in the province)	García Arambilet, 1990
X	Pneumonia (pain in the side)	——	Castile and León	Carril, 1991
X	Congestion	Coca	Segovia	Fragua Gil, 1994
X	Pneumonia	Sariñena	Huesca	Ullod, 1994
X	Pneumonias (pains in the side)	——	Extremadura	Domínguez Moreno, 2000
X	Angina	Romangordo	Cáceres	Domínguez Moreno, 2000
X	Pneumonia	Terras de Tabierós	Pontevedra	Reimóndez Portela, 2001
X	Pneumonia	Jódar	Jaén	Alcalá Moreno, 2002
X	Pneumonia	——	Burgos	Goig Soler, Goig Soler, 2003

ICD-10	Disease or condition treated	Locality or region	Province or Autonomous Community	Reference
X	"Pain in the side"	Campo de Montiel	Ciudad Real	Villar Esparza, 2003
X	Pneumonia	Agurain	Álava	Barandiarán, Manterola, 2004
X	Pneumonia	Sayago	Zamora	Panero, 2005
XII	Pus in sores	Merindad de Campoo	Santander	Moreno Landeras, Gutiérrez Delgado, 2001
XII	Alopecia, to grow hair, moustache growth, regrowing eyelashes	Santibáñez el Alto, Torre de Don Miguel, Sierra de Gata	Cáceres	Domínguez Moreno, 2005
XII	Suppurating acne	Badajoz	Badajoz	Martín Alvarado, 2010
XII	Skin problems	Doñana	Huelva-Sevilla (Andalusia)	Cobo López , Tijera Jiménez, 2013
XIII	Remedy against infected inflammations	La Siberia	Badajoz	Otero Fernández, 1983
XIII	Joint pain	Alburquerque	Badajoz	López Cano, 1984
XIII	Haematomas	Alburquerque	Badajoz	López Cano, 1984
XIII	Backache	Villaverde de Guareña	Salamanca	Blanco, 1985
XIII	Rheumatism	——	Galicia	Vázquez Gallego, 1989
XIII	Gout	——	Galicia	Vázquez Gallego, 1989
XIII	Backache	——	Galicia	Vázquez Gallego, 1989
XIII	Haematomas	Merindad de Campoo	Cantabria	Moreno Landeras, Gutiérrez Delgado, 2001
XIII	Haematomas	Ubrique	Cádiz	Rodríguez Aguado, 2001
XIII	Localised inflammatory reactions	——	Basque Country	Erkoreka, 2002
XIII	Haematomas	——	Basque Country	Erkoreka, 2002
XIII	Heightened blood pressure, haematomas	Guadiana del Caudillo	Badajoz	Vallejo et al., 2005
XIII	Sciatica	——	Palencia	Muriel Martín, 2008
XIII	Haematomas	Comarca de Campoo	Cantabria	Pardo de Santayana, 2008

ICD-10	Disease or condition treated	Locality or region	Province or Autonomous Community	Reference
XIII	Haematomas	Villarta de los Montes, Fuente de Cantos, Castuera, Montijo, La Albuera, La Codosera, Talavera La Real, Fregenal de la Sierra, Guadiana del Caudillo	Badajoz	Vallejo, 2008
XIII	Haematomas	Meliana	Valencia	Carmona Simarro, de Jaime Lorén, Villar Amigó, 2009
XIII	Haematomas	Malpartida de Plasencia, Serrejón, Torrejón el Rubio	Cáceres	Tejerina Gallardo, 2010
XIV	Nephropathy	Campo Arañuelo	Cáceres	Domínguez Moreno, 1999
XIV	Stopping menstruation	Sayago	Zamora	Panero, 2005
XV	Puerperium	——	Soria (widespread use in the province)	García Arambilet, 1990
XV	Relieving the breasts of mothers whose children would not or could not breastfeed	Coca	Segovia	Fragua Gil, 1994
XV	To avoid abortion	——	Asturias	Fernández García, 1995
XVIII	Gangrene	El Arco, Martín de Yeltes, Retortillo, Valdelosa	Salamanca	Blanco, 1985
XVIII	Gangrene	——	Soria (widespread use in the province)	García Arambilet, 1990
XVIII	Pleurisy	Agurain	Álava	Barandiarán, Manterola, 2004
XVIII	Gangrene	——	Palencia (widespread use in the province)	Muriel Martín, 2008
XIX	Bruising	Villaverde de Guareña	Salamanca	Blanco, 1985
XIX	Heatstroke	Candilichera	Soria	García Arambilet, 1990

ICD-10	Disease or condition treated	Locality or region	Province or Autonomous Community	Reference
XIX	Bruising	Fuenteheridos	Huelva	Garrido Palacios, 1999
XIX	Injuries	——	Basque Country	Erkoreka, 2002
XIX	Blows, bruising	Sayago	Zamora	Panero, 2005
XIX	Wounds	Nambroca	Toledo	Díaz de Ancos, 2010
XIX	Bruising	——	Castile-La Mancha	Quave et al., 2010
XX	Snake bite	Valle de Zamanzas	Burgos	Goig Soler, Goig Soler, 2003
XX	Bee and wasp stings	Las Vicarías	Soria	Goig Soler, Goig Soler, 2003
XX	Stings from poisonous animals	Guadiana del Caudillo	Badajoz	Vallejo, 2008
XX	Bites from poisonous animals	Badajoz	Badajoz	Martín Alvarado, 2010
XX	Scorpion sting	Serradilla	Cáceres	Tejerina Gallardo, 2010

Most of the works consulted describe the use of medicinal leeches in relation to the treatment of diseases of the circulatory system (21 references). This is followed by the use of these animals in the treatment of diseases of the respiratory system and the musculoskeletal system and connective tissue (in particular, to drain haematomas); the use is mentioned in 14 and 13 works respectively.



Number of bibliographical references describing the use of leeches in relation to different chapters of diseases listed in ICD-10.

As has been mentioned earlier, many of the applications of medicinal leeches were also used in scientific medicine until the start of the 20th century, including inflammation, blood congestion, cerebral congestion, gout and pneumonia. Hirudotherapy in scientific medicine was in widespread use throughout Europe and reached its peak between 1830 and 1850 (Gross, Apesos, 1992, p.343). At the start of the 20th century it was still being used in Spain, as can be seen in the treatment administered to Germán Gamazo, a minister during the reign of Alfonso XII and the regency of Archduchess Maria Christina of Austria, during a serious illness in 1901.

The minister was suffering from pulmonary congestion following a heart complaint which was treated at first with caffeine and the application of three dozen leeches on his side and later with an anti-asthmatic[6].

Leech therapy was to fall dramatically into disuse, and so, for example, Sobrino Serrano (1936) in the *Revista de Higiene y Sanidad Pecuarias* (lit. Journal of Livestock Health and Hygiene) wrote: "*The application of leeches was well regarded for a long time, for easing the pain of bruising and even preventing later complications; nowadays they are hardly used, but ordinary folk continue to have faith in this remedy*" (Sobrino Serrano, 1936, p.76).

Until the 40s the freshwaters of Doñana (Andalusia) were involved in the collection of leeches for medical use, targeting even export to America and European countries. In ponds and streams where leeches were abundant, their capture brought to the inhabitants of this area a great economic profit, far greater than catching fish. Their disappearance triggered in the last third of the century, due to predation caused by the introduction of the red swamp crawfish –*Procambarus clarkii* (Girard, 1852)– and water pollution (Cobo López, Tijera Jiménez, 2013, p.162).

In the 1950s Spanish society was aware of the abandonment of this medical practice, as can be seen in this sentence of the writer José María Gironella in his article in the newspaper *ABC* of 17 February 1953 (page 3): "We have progressed from the leech to the ECG without interruption". Hence, he was very puzzled in March of that year by the fact that Stalin was treated by medicinal leeches to regulate his blood pressure when he was nearing death[7]. Leech therapy was to survive only in folk medicine, with leeches losing their reputation as a therapeutic agent until their rediscovery in the

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6 As explained by the newspaper *La Vanguardia* of Thursday 25 September 1901, p.5.

7 As explained by the newspaper *La Vanguardia* and ABC of 6 March 1953, p.6 and p.17 respectively.

1990s, thanks to their application in reconstructive and reattachment surgery (Wells et al., 1993; Soucacos et al., 1994; Mory, Mindell, Bloom, 2000; Frodel, Barth, Wagner, 2004; Whitaker et al., 2004; Michalsen, Roth, Dobos, 2007; Porshinsky et al., 2011) and areas such as urology and angiology (Cornejo-Esquerra et al., 2009). At present leeches are used in microsurgery to reduce, effectively, post-operative haematomas and venous congestion. Complications from leech therapy are due to bacterial infections from pathogens such as *Aeromonas hydrophila*, *Serratia marcescens*, *Aeromonas sobria* or *Vibrio fluvialis* (Bauters et al., 2007; Cornejo-Esquerra et al., 2009). In the particular case of folk medicine in Spain, the possibility of leech therapy inducing Weil's syndrome (leptospirosis icterohaemorrhagica) cannot be excluded. This syndrome is an endemic disease common until the middle of the last century in lacustrine areas such as the Ebro Delta, the Huerta de Valencia and the Andalucian marshes; it follows the course of fever, hepatitis, jaundice and, sometimes, death (Barragán Casas et al., 2001; Roca, 2006).

Further to the medical applications of leeches, it is worth noting that several anticoagulants, such as hirudin, mentioned above, have been extracted from their salivary tissues and they have a biomedical and pharmacological use (Markwardt, 2002, *passim*; Hildebrandt, Lemke, 2011, *passim*; Zaidi et al., 2011, p.59-62). Moreover, the contemporary use of these animals includes not only medical purposes they are also a good animal model for neurobiology (Elliott, Kutschera, 2011, p.25). Due to the anti-coagulant and blood circulation enhancing effects, their use was approved as a medical device by the U.S. Food and Drug Administration in June 2004 as "An adjunct to the healing of graft tissue when problems of venous congestion may delay healing..."[8]. In this indication, leech therapy is common standard practice in countries like USA, England or Germany. The medicinal leech, together with maggots –most frequently the larvae of the common green bottle fly *Lucilia sericata* (Meigen, 1826)– (Cherniack, 2010, pp.124-125; Britland et al., 2011, *passim*; Zarchi, Jemec, 2012, *passim*), are practically the only animal species directly applied in modern medicine.

Turning now to Spanish folk medicine, the study carried out by Becoña between 1974 and 1978 contains information from a respondent who applied leech therapy in a case of pneumonia (Becoña, 1981, p.196). Rúa Aller and Rubio Gago, in their study on folk medicine in León, published in 1990,

[8] See document [on line], available at: http://www.accessdata.fda.gov/cdrh_docs/pdf4/K040187.pdf, [consulted on: 24 May 2012].

provide descriptions of fishing for leeches destined for blood-letting carried out thirty or forty years before then (Rúa Aller, Rubio Gago, 1990, pp.67-68).

Recent studies in the field of Medical Anthropology and Ethnomedicine carried out in Extremadura, Catalonia and the Basque Country mention that the respondents have knowledge about the use of leeches and many of them remember people who have used them (Erkoreka, 2002, p.130; Penco, 2005, p.694; Gregori, 2006, p.158; Vallejo, 2008, p.251; Martín Alvarado, 2010, p.95; Altimiras, Casassas, Montañà, 2011, p.103). In El Monfragüe Natural Area (Cáceres), use of them was very much alive in the 1930-1940s, and especially after the Civil War (though not any more). In the municipal areas of Malpartida de Plasencia, Serradilla and Torrejón el Rubio, these decades coincide with the childhood of key respondents who confirm the habitual and frequent use in the past by the local population (although there were skilled individuals). Their recollection was based on visits to areas of running water, fountains, ponds, etc., and the purpose of their use was usually the effect of draining blood accumulated from accidental hard blows (Álvaro Tejerina Gallardo, personal communication). J. M. Barandiarán described the use of leeches at the end of the 1970s, a time when a practitioner in San Martín de Unx (Navarra) had to rely on leeches at his place of work for patients who required them (see Barandiarán, Manterola, 2004, p.329). Therefore, it is certain that leeches formed part of the therapeutic arsenal of Spanish folk medicine, at least until the 1970s, a time when scientific medicine in Spain had already banned their use. However, given the importance of leeches in folk medicine it is possible that at the end of the century they were still being used locally, but there are no studies to corroborate this. It could be assessed in future ethnobiological research carried out in lacustrine areas of national importance, such as the Ebro Delta mentioned previously, following the guidelines established by the *Inventario Español de los Conocimientos Tradicionales* (Spanish Inventory of Traditional Knowledge) (see Pardo de Santayana et al., 2012).

History of the use of leeches in Spain

The wholesale and retail sale of leeches[9] formed a part of business in Spain until the middle of the 20th century. Our country was one of the largest producers of medicinal leeches in the 19th century, together with

[9] See, for example, the advertisement published in *La Vanguardia Española* on 10 December 1918, p.16, from a businessman from Sabadell engaged in two-way trade in leeches.

Hungary, Bohemia, Italy, Turkey, Egypt and Algeria (Oriol Ronquillo, 1857, p.258).

When physiological medicine was at its height, the consumption of leeches was considerable, particularly in large areas of population. Exorbitant prices were paid for them and fraud occurred, which prompted initiatives by health professionals, such as the creation of a wholesale sales company by a group of professors of Medicine and Pharmacy in Extremadura. They received orders at the dispensary of D. José María de Prado, in the calle Postas de Madrid in Cáceres, through the pharmacist D. Manuel Sala and in Malpartida by his colleague D. Francisco Casado[10]. However, the specialised press of the day gathered opinions which advocated the need to regulate this medicinal product for health purposes. Thus, the journal *Boletín de Medicina, Cirugía y Farmacia*, on page 94 of the issue of 25 February 1836, replied to a "letter to the editor" as follows: *"There is no doubt that leeches are often not available when most they are needed, that at other times they are available at a price that is unaffordable to most of those who need them, and not infrequently official leeches offered for sale are of varieties of this animal that are not appropriate for their indication; and these unsuitable ones are not of such little significance as to not require the attention of and remedy on behalf of public health.The idea of making it obligatory for pharmacists to have leeches available in their dispensaries is not new, nor does it appear to us difficult to adopt, provided that it is prohibited to sell them in other shops; but above all it would be advisable to encourage the trade to devote some attention to the propagation and preservation of these valuable creatures, which have already been the subject of many essays and numerous works, which one day we will summarise*."

These views indicated that if pharmacists had the exclusive right to preserve these animals, the leech collectors or gatherers who went out to find them would have more security in their shops, and the price would be more stable.

Leech collectors carried out their work via an extensive trade network at its height until the early years of the 20th century. The last of these in the municipality of Urdiain in Navarra, who died in 1927, distributed his medicinal leeches in the areas of Álava, Guipúzcoa, La Rioja, Navarra and Vizcaya[11]. Tejerina Gallardo relates how his informants remembered a famous female leech collector from Malpartida de Plasencia (Cáceres), who, after catching

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10 See *Boletín de Medicina, Cirugía y Farmacia* of 25 February 1836, p.94.

11 See Satrústegui [1972] cited by Erkoreka [2002, p.130] and Dueso [2001, p.37].

them, kept them in her home for sale. Users returned the animals to her, and she then placed them into cereal husks to clean them (Tejerina Gallardo, 2010, p.444).

Ever since the Middle Ages it was clear that the most suitable habitat for finding them was clear pebbly streams free of mud, an important biological indicator being the presence of tailless amphibians (Gil-Sotres, 1990, p.22). Barandiarán describes how in the Basque Country they were gathered in watercourses near to towns and villages and in stone basins, ponds or animal drinking troughs (Barandiarán, Manterola, 2004, p.328). It was considered that there were two ideal times for collection, one in late spring at the start of summer, and the other from the end of summer until the start of autumn, due to the nutritional requirements of the annelid in the face of food shortages and lack of rain. Various methods were used to catch them: they could be caught using wide mesh nets hung across cattle troughs, between where the animals passed; by casting the skin of a lamb, of other recently skinned animals or liver into water; or by walking along banks barefoot. Collections using animal baits were considered to be of low quality, since "being full of blood they were barely alive" and they could not be used until some time had passed (Oriol Ronquillo, 1857, p.256; Carril, 1991, p.63; Fragua Gil, 1994, p.750; Penco, 2005, p.656; Muriel Martín, 2008, p.35, Barandiarán, Manterola, 2004, p.328, 333).

Once the animals had been obtained, the leech collectors would carry them in cloth bags that they would keep moist, in baskets, boxes with moss or moist straw or wooden buckets with wet clay. Sometimes, the journey could last up to eight days, so it was necessary to change the water and clean the bags, boxes and baskets every two days to keep them healthy, although they could remain alive for about a week in tightly sealed jars filled with water. In Galicia, according to reports from the mid-seventies of the last century, a leech collector would often make journeys of up to 70 miles, such as, for example, from Lalín to Estribela, carrying the leeches in tins containing water over his shoulder (Becoña, 1981, p.196). These professionals supplied the traditional healers in the various Spanish regions, such as the Asturian "folk doctors" who, as well as using medicinal plants such as rue, rosemary, arnica or mallow, roots, tree bark, poultices and ointments, carried in their large leather bags partridge feathers, snakeskin shirts and, of course, leeches (Junceda Avello, 1987, p.26). However, there was a specific professional who applied "hirudotherapy", called a "bleeder", and about whom historical documents from the 16th century exist in Palencia (Muriel Martín, 2008, p.35).

During the 19th century the varieties *grisea* and *viridis*, caught in the Serranía de Cuenca area and in Extremadura, were highly prized and exported abroad (Amo y Mora, 1869, p.325). Similarly, although in the second half of the century there were not sufficient numbers of them even for domestic consumption, the leeches from the Limia area in Orense province also enjoyed great fame leeches (Fulgosio, 1865, p.23).

Various methods were used to apply leeches and perform the blood-letting: they were placed on limbs with a cup over them; they were applied to the sides or behind the ears, sometimes in the groin or on the back or the temples, according to the condition (Oriol Ronquillo, 1857, p.255; Saura, 1880, p.54; Dueso, 2001, p.37; Barandiarán, Manterola, 2004, p.331-333; Rabal Saura, 2006, p.127).

Moreover, the treatment with leeches that made the physiological medicine of Broussais fashionable caused the consumption of these animals to soar, reaching its height between 1830 and 1850, a period when their populations began to decline (Gross, Apesos, 1992, p.343; Elliott, Kutschera, 2011, p.24). In Spain, in the face of increasing commercialisation and fluctuation in the populations of the creatures, legislative measures were brought in constantly for years. In 1827, the Royal Order of 17 January permitted the introduction of leeches on prior payment of taxes; the ruling of 23 January permitted their export, and the one of 9 August 1827 prohibited their collection in the months of March, April and May. The order issued on 23 July 1833 banned the introduction of foreign leeches and it was argued that if they were scarce in one province, a neighbouring province could provide supplies[12].

Moving forward in time by about 50 years, we find the Royal Decree of 13 July 1882, in which the regulations and tariffs by which the industrial and commercial tax contributions were to be governed were approved. In this document we can see how each speculator or dealer in leeches would pay 100 pesetas[13]. In the newspaper *ABC* of 28 September 1945 (page 6) we find a reference to the abuse that occurred in this operation: "*In 1837, France was exporting Spanish leeches by the million, 35 million of them, since at that time the*

[12] The provisions can be consulted in the *Real Consulado de Madrid (1828), Guía mercantil de España: 1ª Parte*, Imprint of I. Sancha, p.182-183.

[13] Due to the importance of this general rule, the daily newspaper *La Vanguardia* published it in successive supplements starting from the edition of July 20, 1882. The mention of leeches appears in the supplement of 4 August, p.2. Available at: http://hemeroteca.lavanguardia.com/preview/1882/09/16/pagina-2/34700088/pdf.html?search=sanguijuela [consulted on: 25 Aug 2012].

French blood-letting market needed the frightening number of 55 million leeches annually".

In the mid-20th century France needed a supply of these annelids for therapeutic purposes and a significant import business developed there, as can be seen in the notice published in the issue of *ABC* on 5 May 1951, page 18: "*The Business Expansion Service, under the Sub-department of Foreign Economy and Trade, would like to announce that the French market is interested in importing leeches from Spain, and it will accept all sizes, regardless of quality. Those interested in exporting them can obtain information from Velázquez 47*".

Given this over-exploitation, which decimated the local populations of medicinal leeches, an industry began in the breeding and extensive farming in ponds of the animals until the second half of the 20th century. The conservation and breeding nurseries of the herbalist D. José Vilá at Villa de Gracia (Barcelona) were very famous. Furthermore, hospitals had nurseries for their own supplies (Oriol Ronquillo, 1857, p.257; Amo y Mora, 1869, p.327).

Currently, no species of medicinal leech appears to be protected under Spanish law, nor is on the Red Books of Threatened Species; however, the International Union for Conservation of Nature (IUCN) includes *Hirudo medicinalis* on its Red List in the "Near Threatened" (NT) category[14].

Today there exists a thriving international trade in medicinal leeches as a result of a resurgence in their therapeutic use. Demand for them has led to Spanish companies engaging in their purchase and sale (e.g. Antoni Carles S.A. in Catalonia and Clínica Virgen Blanca in Bilbao[15]). Although their use in Spain is not very widespread, some pioneering hospitals exist, such as the University Hospital Joan XXIII in Tarragona, where leech therapy is used in patients treated with microvascular grafting (see Mozos-Pérez, Font-Jiménez, 2007).

On the international level, the supply of leeches by companies engaged in breeding and farming them is a reality. They supply hospitals and clinics, as well as general practitioners, physiotherapists, naturopaths, research laboratories, universities, pharmacies and even individuals. Suppliers can be named, such as the French company RICARIMPEX SAS[16], the German

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14 World Conservation Monitoring Centre 1996. *Hirudo medicinalis*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2013.1. <www.iucnredlist.org>. Downloaded on 01 July 2013.

15 http://latinoamerica.perfeto.com/k-12358/sanguijuelas-para-uso-medico.html [consulted on: 25 Aug 2012].

16 http://sangsue-medicinale.com/ [consulted on: 22 Aug 2012].

leech breeding farm Biebertaler Blutegelzucht GmbH BBEZ[17], Biopharm in the United Kingdom, or Connecticut Valley Biological Supply and Leeches USA in the United States (Cornejo-Esquerra et al., 2009). Therefore, the social and healthcare activities related to hirudotherapy in Spain could inspire scientists who study medical pluralism in various fields, such as Medical Anthropology, History of Medicine, Ethnobiology or Ethnomedicine.

Conclusion

Leech-based therapies were part of the therapeutic arsenal of pre-scientific, primitive and popular medicine, but also of official medicine, with some interruptions in their use. In Spain there was a big increase in it as a result of the physiological medicine of Broussais, only for it to be subsequently relegated to the level of folk medicine and, finally, according to the available literature, being abandoned (in the 1970s, approximately). However, it would be useful to study the possibility of some later local use in lacustrine areas of national importance, which could be reinforced by the current growth in popularity of leech therapy. In fact, the resurgence in the use of leeches in biomedicine and the multiculturalism and potential of information and communication technologies, open up the possibility of a new movement in the popular use of these annelids. We concur with authors such as Erkoreka [1993, p.417-418, 2002, p.21-22], in claiming that approximately half of the practices in folk medicine have a basis in science, since scientific ideas dismissed as a result of paradigm shifts, or technical innovation, become established in folk treatments. In the case of remedies based on the use of leeches, we can observe that illnesses such as pneumonia, gout and inflammation, among others, have been treated using both medical systems.

During the 19th century medicinal leeches were over-exploited, which affected the growth rate of their populations. In Spain businesses were created to breed and farm them. At the time covered by our study there was commercial activity in leeches that was halted by the fluctuations of history in their therapeutic use. Companies engaged in the purchase and sale of leeches for medical use currently exist in our country.

Over-collecting for medical purposes is unlikely to be a threat in today in Spain, given the ability to breed leeches commercially. Perhaps a more significant issue is the conversion of their habitats into arable farmland,

[17] www.blutegel.de [consulted on: 07 Sept 2014].

resulting in potentially dangerous lowering of water levels, the invasion of scrub around ponds and pollution.

Spain differs to a great extent with respect to the use of medicinal leech therapy as compared to countries like USA, England, Germany or Russia. For example, the legal prerequisites of conducting leech therapy are well defined in USA and Germany, in contrast to the not clearly specified legal situation in Spain. In USA, leech therapy is registered by the Health Authorities as "Medical Device" and in Germany as "Medicinal Product", implicating all legal requirements on pharmaceutical quality control or safety reporting.

In line with the resurgence of leech therapy in many countries over the last 40 years, this treatment is nowadays turning from mere folk medicine to a modern scientific therapeutic approach. More and more, evidence-based material helps to separate leech therapy indications which are only justified by folk tradition from clearly defined indications based on solid data from clinical studies, approved by Health Authorities. This ongoing development in these countries should encourage also therapists in Spain to contribute to the international scientific knowledge leading to the rational use of medicinal leech therapy in alternative medicine.

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Sažetak

U Španjolskoj su pijavice dugo tijekom povijesti korištene kako u narodnoj tako i u znanstvenoj medicini. Ovaj rad analizira trendove u primjeni terapije pijavicama kroz povijest. Na početku 20. stoljeća pijavice su se još uvijek koristile u znanstvenoj medicini, što dokazuje slučaj liječenja Germana Gamaza, ministra za vrijeme vladavine Alfonsa XII i kraljevanja nadvojvotkinja Marije Kristine Austrijske, u vrijeme kada je ozbiljno bolovao 1901. godine. Nakon toga, pijavice gube ugeld kao terapijsko sredstvo, njihovo korištenje u terapijske svrhe značajno opada u znanstvenoj medicini, te se održava tek kroz narodnu medicinu. Podaci predstavljeni u ovom radu dobiveni su sustavnim pretraživanjem literature i glavnih baza podataka iz područja folklora, etnografije, socijalne antropologije i medicinske antropologije. Pijavice su se u koristile u španjolskoj narodnoj medicini za liječenje bolesti i poremećaja iz 11 kategorija Medunarodne klasifikacije bolesti i srodnih zdravstvenih problema (MKB-10), osobito u liječenju bolesti cirkulatornog, dišnog i koštano-mišićnog sustava. Prema dostupnoj literaturi, pijavice su predstavljale jednu od terapijskih mogućnosti narodne medicine, barem do sedamdesetih godina prošlog stoljeća. Naše istraživanje također pruža informacije o medicinskoj primjeni, trgovini i konzumiranju pijavica u posljednjih nekoliko godina.

Ključne riječi: *Ljekovite pijavice; narodna medicina; povijesni pregled; potrošnja; Španjolska*